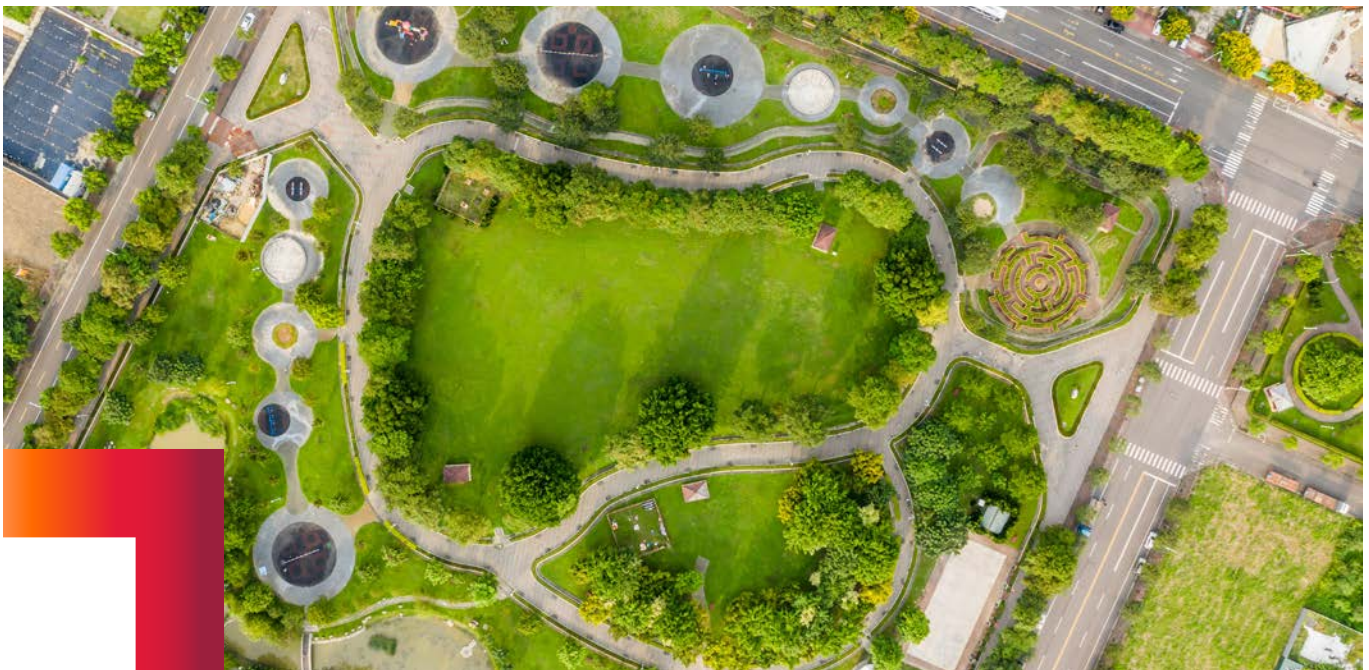


Five ways technology can improve environmental regulatory enforcement

ARInspect

CGI



Each of us wants to live and raise a family in an environment where the air is clean and the water is free of harmful pollutants. Americans count on environmental enforcement experts to evaluate compliance with regulations such as the Clean Air Act and Clean Water Act, and to pursue enforcement actions when agencies identify non-compliance.

While federal agencies such as the U.S. Environmental Protection Agency, U.S. Department of Agriculture, and the Food and Drug Administration oversee environmental enforcement programs, they partner with state, municipal and tribal agencies with delegated authority for primary monitoring and enforcement within their jurisdictions. Across the U.S., these agencies monitor more than 40 million facilities—from privately owned industrial campuses to municipal wastewater treatment plants. The number of sites, impact to communities, multiple regulatory entities and various regulatory standards make the environmental compliance landscape inherently complex to manage.

Despite the critical importance of environmental regulatory efforts, enforcement organizations often lack the technology assets required to effectively manage this level of complexity. Often, field inspectors still use pen and paper to collect information, and spreadsheets to analyze historical data. While mobile inspection applications do exist, many provide little more than simple electronic data collection. Inspectors must still spend hours combing through information from past inspections to find flagged items that merit closer attention. Time spent conducting this research could be spent on inspecting more locations and areas of concern.

To protect human health and the environment, environmental inspectors need a more technology-driven, risk-based approach. With increased funding and focus on climate change and environmental justice, now is the time to evaluate the role that technology can play in improving our nation's approach to environmental enforcement.

Making an impact with technology

Many technologies that are standard tools of the trade across other domains are only now being introduced to the environmental regulatory community. As environmental regulators look to improve their productivity and efficiency, and deliver more proactive support to the communities they serve, we suggest they prioritize the following technology investments.

1 Mobile inspections. Field inspectors benefit from mobile capabilities that increase efficiencies and productivity. Many agencies are already investing in enforcement applications to maximize inspectors' time. Mobile inspection apps can eliminate manual, paper-intensive, desk-dependent data entry and access. In our experience, the use of such technologies can increase inspector time in the field by 50 percent. That means more time collecting data and more inspections completed. Mobile technologies like smartphones and tablets allow inspectors to capture inspection results and photos directly into the record. By compiling data digitally at the source, mobile inspection solutions can generate corrective action reports that can be emailed to the facility contacts at the end of the inspection.

Digital data capture, though, is just the beginning. In most cases, inspectors are still returning to the office to compare the most recent inspection data to historical data using spreadsheets and manual analysis. Agencies should mature their solutions to enable in-the-field access to data from prior inspections for more targeted reviews. Integration of historical records puts decades' worth of data into the hands of inspectors, enabling them to pinpoint high-risk areas and work more efficiently. Inspection apps with these features help inspectors not only record results but also deliver meaningful corrective action guidance.

A state agency responsible for inspecting 150,000 pieces of regulated equipment turned to CGI and ARInspect to improve inspector productivity with a **Smart Inspection Platform**. The platform provides real-time access to information and enables in-the-field scanning to ingest data directly into the state-wide environmental management system. Through advanced mobile technologies and use of image recognition, the agency reduced total inspection time by 93 percent.

2 Remote inspections. While in-person inspections have been the norm for many regulatory processes, such as housing, banking inspections and environmental enforcement, the pandemic turned the status quo on its head. Health and safety concerns forced agencies to rethink the traditional in-person workflow. Now, more agencies are introducing workflows that allow inspectors to conduct collaborative virtual inspections via online meeting tools. Video calls facilitated between an inspector and an onsite employee or representative of the inspected site allow for social distancing while still enabling the collection of critical data. Inspectors can record online inspections to add to the record or capture still images from the recording, just as they would had they been onsite.

Agencies should consider incorporating remote inspections into their workflows for many (but not all) types of inspections as a standard practice. For example, an agency may send an inspector out into the field for larger facility inspections or when they must capture direct readings of samples while allowing remote inspections when the inspector simply needs to verify remediation of a previously identified non-compliance. In addition, agencies may look to remote follow-up inspections as a means to gain efficiencies. Facility contacts can upload documents or provide proof of compliance by sending data directly to inspectors - ideally through an online interface. Mobile inspection apps that provide this level of collaboration provide a seamless interface between inspectors and facility contacts for communicating and exchanging documents—improving the user experience for facilities and streamlining follow-up inspections.



3

Unmanned aerial systems. Unmanned aerial systems (UAS) have emerged as a promising tool for environmental agencies to obtain data from remote locations, respond to emergencies and improve worker safety. In recent years, the use of drones has expanded in the environmental domain as costs have decreased—a small drone can cost as little as a few hundred dollars while larger, fixed-wing UAS often used for mapping land spanning hundreds of acres can run between \$5,000 and \$25,000.

In February of 2021, the Environmental Council of the States published a report entitled *State Environmental Agency Modernization — Leveraging Unmanned Aerial Systems to Improve Environmental Results*. Their research cited broad use of UAS for environmental purposes including:

- Emergency preparedness and response
- Monitoring water for various conditions, such as algal blooms, E. Coli contamination, cyanobacteria growth or Per- and polyfluoroalkyl substances (PFAS)
- Mapping
- Mining, watershed and groundwater inspections
- Dam inspections
- Volume and construction estimation
- Drinking water and coastline inspection

In some case, drones can be more cost-effective than in-person inspections or other aerial methods. Where environmental agencies are monitoring sites over time, the return on drone investment can be significant, empowering regulators and researchers with data that previously would have been cost-prohibitive to collect at the same frequency.

Agencies that have introduced drones for limited use are now expanding into other use cases. As UAS programs mature, agencies may also integrate UAS with Internet of Things (IoT) solutions such as thermal/infrared sensors, and expand the number and size of their UAS investment to support more mature mapping and spatial analysis.



4

Artificial intelligence and machine learning.

Environmental regulatory agencies continually face workload challenges. With the increased impact of climate change and focus on environmental protection—particularly for historically underrepresented communities—compliance and enforcement agencies must find ways to do more with existing resources. Today, inspections are routinely scheduled either “for cause” in response to citizen or employee complaints or based on evidence of a possible violation, or through “neutral selection,” based on cost factors such as proximity to other facilities being inspected or time elapsed since the last inspection. Automation, powered by artificial intelligence, can aid inspector productivity and efficiency in the field and enable the transition from a schedule-based to a risk-based, data-driven enforcement approach.

Enforcement agencies hold a wealth of historical information; however, that information often sits within documents and databases—past inspection reports, photos, videos and satellite images—or streaming from edge devices such as sensors within and outside of facilities. Technology is key to enabling the effective and efficient examination of the sheer volume of data to make informed decisions. Applying technologies such as artificial intelligence and machine learning, agencies can leverage that data to identify trends at a given facility and prioritize inspection activities according to risk.

With IoT devices capturing more and more environmental data, it is imperative that enforcement organizations leverage that data for informed decision-making. By combining data from various sources—such as air sensor data and satellite

imagery—technology can proactively identify non-compliances and anomalies that require human follow-up. Depending upon the nature of the issue, the enforcement agency may wish to send specialized inspectors to that site, ensuring the most qualified experts are targeted where they can make the greatest impact. In general, AI-driven complexity scoring can assist agencies in assigning the most appropriate personnel to a given inspection.

Artificial intelligence enables the analysis of data and identification of patterns, modeling human-like behaviors such as problem-solving, planning and learning. A type of artificial intelligence, **machine learning** uses algorithms to analyze data beyond what a human could achieve.

Considering the large volume of data inherent in facility monitoring—for example, real-time data from sensors and similar IoT devices—machine learning holds great promise for harnessing large volumes of data to understand and even predict environmental outcomes.

We foresee significant investment in both artificial intelligence and machine learning in the environmental regulatory sector moving forward.

5 Tailored, integrated solutions. While new technology investments can deliver significant gains in productivity, mobile apps, remote inspection capabilities, UAS and other investments are just the beginning. Environmental enforcement agencies must continue to evolve their IT solutions to more tightly integrate their end-to-end enforcement business processes. The biggest barrier to scaling the use of data across the enforcement process end-to-end is a lack of integration between permitting, enforcement and compliance systems.

Most environmental enforcement agencies rely on a separate system or systems for each of these core business processes, often built on legacy technologies. Accessing data across processes and systems is difficult. Staff in the field face even greater challenges accessing data and gaining insights from it in real-time. To harness the power of data, systems must be more tightly integrated, with a seamless workflow between connected systems. Business processes must evolve from printing out and analyzing years of inspection reports and violation histories in advance of an inspection and, instead, provide easy-to-understand analytics and reports that provide a targeted view of the facility or location.

As agencies look to modernize their IT solutions, they should incorporate capabilities that will provide historical data to inspectors on the edge, even when they are in remote locations and their mobile devices are offline. Giving inspectors the power to combine and examine data currently collected and housed in a variety of systems will help environmental enforcement personnel potentially identify problems with products or systems before they impact the community.

With a varied collection of legacy systems across the agency, it may be difficult to determine where to start. Working with a knowledgeable systems integrator and taking an agile approach can help agencies establish an achievable modernization roadmap that delivers value in the near-term and significant improvements as systems and processes become more tightly coupled.



Our experts



Vivek Mehta

Co-founder and CEO,
ARInspect



Nikhil Patil

CGI Director Consulting Expert,
Environmental Practice



Lee Peterson

CGI Senior Consultant,
Environmental Practice



Gregory Slusher

CGI Senior Consultant,
Environmental Practice

About ARInspect

Every day, federal, state and local government agencies deploy thousands of inspectors into the field to monitor the air we breathe and the water we drink, helping protect the health and safety of the communities in which we live and work. ARInspect's Smart Inspection Technology provides agencies and inspectors a modern, SaaS platform for compliance monitoring, enforcement and inspections. With ARInspect, agencies can harness the power of geographic information systems, artificial intelligence, robotic process automation and remote inspection features for proactive identification of compliance risk. Our solutions enable inspectors to be more precise, efficient and effective in protecting health and the environment.



About CGI

Insights you can act on

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

[cgi.com](https://www.cgi.com)

© 2022 CGI Inc.

